LadHyX Seminar – February 5th, 10:45

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Transport and dispersion of motile bacteria in micro-channel

Bacteria are ubiquitous in nature, populating oceans, rivers, soils, and guts. During parts of their life cycle, bacteria have the ability to swim to reach their ecological niche. In most cases, the liquid environment in which they swim flows. In this case, the transport of a bacterial suspension is a complex interplay between bacterial motility, the external flow, and the possible presence of surfaces.

To tackle this question, we used a suspension of Escherichia coli, a rod-shaped bacterium that moves thanks to a "run and tumble" dynamic. During the run phase, the bacterium swims in a straight line, while in the tumble phase, the bacterium stops and changes direction randomly. We flowed a suspension of E. coli inside a micro-channel, and thanks to a 3D Lagrangian tracking system developed in the lab, we were able to individually track the bacteria in 3D and in a flow. From the 3D trajectories of the bacteria, we could precisely assess the role of motility, surfaces, and flow on the transport of the suspension. In particular, we find that surfaces plays a major role in the hydrodynamic dispersion by retaining bacteria.